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REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

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Light and Shade.

The gloomiest day hath gleams of light,
The darkest wave hath bright foam near it;
And twinkles through the cloudiest night
Some solitary star to cheer it.

The gloomiest soul is not all gloom;
The saddest hour is not all sadness;
And sweetly o'er the darkest doom
There shines some lingering beam of gladness.

THE ELECTRIC LIGHT

The Progress of the Electric Light.

Those of us who remember the celebration of the Centennial anniversary at New York on the evening of July 3d, 1876, will also remember that one of the features of the affair was the establishment of an electric arc light on the top of the tower of the Western Union Building, 195 Broadway.

This light was produced by electricity developed by a Wallace machine, and was at that time regarded as one of the wonders of the world.

Since that time the march of electric illumination has been rapid and progressive. Before the close of 1876, we knew all about the way the Jablochkoff candle was illuminating Paris and London; and it was currently reported that now we were going to have the only feasible electric light, and that it was impossible to produce a number of arcs in one circuit.

This was very soon disproved by Mr. Brush, who soon made it plain that it was possible to place not only more than one, but as many as thirty or forty arc lights on a single circuit.

During the past year the Brush Co. has well maintained its position in the foreground of arc lighting, and has more installations, and more arc lamps to day in use, than any other company.

One of the causes of the prosperity and success of the Brush people, is the attention paid to their conducting lines, and the care with which such lines are constructed and maintained. In New York and Boston, for example, all the lines of the Brush Co. are daily patroled by an inspector.

In arc lighting, during the past year, the improvements have been chiefly in matters of detail, the carbons have been made more perfect, the lamps have been made more sensitive, and the machines which would not appear to be susceptible of much improvement in principle, have been carefully kept up to their high standard of mechanical perfection.

Two important moves have been made by parties in the Brush interest during 1882, namely: The Lane-Fox and Swan incandescent lamps have been to a certain extent endorsed, and associated in England, at least, with the original business of arc lighting; and the secondary battery of Mr. Plante has been improved upon by Mr. Brush so effectually, that at the recent exhibition given in this city, a series of twenty cells, contained in a box eight feet long, fifteen inches wide, and sixteen inches high, which had been charged from an arc light circuit wire, were used to feed twenty-eight Swan lamps of sixteen candle power, and to run a small motor of one horse power.

Other interests have by no means been idle. In the arc field great progress has been made by companies operating under the Weston & Fuller patents; while the Electric and Illuminating Co. has attained considerable success, especially in Boston, where it succeeded the American Electric Light Co., of Massachusetts, which, after a short life and a merry one, collapsed.

In the incandescent lighting field, however, the greatest and most numerous strides forward have been made.

Swan and Lane-Fox have been so far the favorites in England; the former having achieved the first brilliant success in theatre lighting.

This was the Savoy theatre in London, where no less than 1,158 lights are used.

The crowning triumph in incandescent electric lighting, however, is the wonderful installation of Edison, where a large district of the city of New York, *i.e.*, that bounded by Wall, Spruce and Nassau streets and the East River, is lighted from one central station.

Many of the stores and houses in this district are thus lighted, and the light has given general satisfaction; mechanical difficulties being the only ones which seem to have presented themselves. The conductors in this installation are all underground; the majority of the lamps are sixteen candle power; and the engines at the central station are over 200 horse power.

Nothing is more remarkable in this, than the perfection to which every detail is worked out from the huge steam engines and ponderous dynamos, to the delicate lamps and their ornamental fittings, and the care which has been manifested in all branches of construction.

Turning to dynamo-electric machines, we find that the great machine of Edison is the only one which is large enough to supply a continuous current for over a thousand incandescent lamps.

Two startling novelties have appeared in alternating current machines, viz., those of Gordon and Ferrante.

It does not as yet seem clear as to where and how these machines are used, since the only form of light which absolutely requires alternating currents is the "candle." Moreover, the element of time comes into account in all such machines, and it is likely that retardation would be manifested in long insulated conductors.

One town, that of Chesterfield, in England, has been fitted with electric lights, which have been severely criticised, especially such of the lamps as were operated on the incandescent plan (Lane-Fox); but they are said to be now working well.

Taking it altogether, 1882 has been the year of advance, and has proved that the electric light has indeed, as we declared twelve months ago, come to stay

Some are still asking whether the electric light will supersede gas?

Did the locomotive supersede horses? Did gas supersede candles and oil? Did the telephone supersede the telegraph? The answer is obvious: No, it may improve gas and gas appliances.

The electric light will surely supersede the gas light, but not gas as an article of manufacture.

Converting Mechanical Power into Electricity.

BY CHARLES E. BUELL.

The first notice yet found of exciting electric action by the revolution of a magnet is in a manuscript work written by an Arabian, named Bailak, in the year 1242. The work is entitled "The Merchants' Guide in the Purchase of Stones." Referring to the loadstone, he states that captains sailing in Syrian waters magnetized needles, so that they would point north and south by rotating a loadstone over them.

It was discovered by Faraday in effect that, when a conductor was made to pass through the lines of force in the magnetic field, an electric current is developed. This was in 1831

In 1832, Joseph Saxton, of Philadelphia, invented and made a magneto-electric machine which marks the era of conversion of mechanical power into electricity. Mr. Saxton—afterward attached to the United States Coast Survey—who invented this first machine for producing electric currents, made use of soft iron cores wound with insulated wire. The cores, being in horse-shoe form, were made to revolve before a stationary permanent magnet.

He employed an instrument maker, by the name of Pixii, to construct a second machine, who constructed also one, in which the soft iron cores, covered with wire, were stationary, and the permanent mag-

net revolved in a vertical position. Pixii succeeded by advertisements, and by an actual exhibition of the machine in France, in attaching his name to the invention, to the exclusion of that of Saxton. However, German works and the better class of English publications do justice to Mr. Saxton.

In the Saxton machine, at each half of the revolution, the magnetism in the soft iron cores was reversed, giving currents alternatately in opposite directions. In 1836, Clarke, in London, made a magneto-electric machine, in which coils were rotated opposite compound steel magnets, and Breton wound coils on the poles of permanent magnets, and rotated an armature in front of them, developing currents of electricity in the coils of wire. The relation of this action to Breguet's apparatus for firing mines and to the Bell telephone is worthy of notice.

In 1837, Charles G. Page, of Washington, D. C., improved the previous existing forms of machines for generating electric currents by conducting the opposing currents into one direction; and by novel construction of the armature coils, and of the commutator (or "unitress," as he called it), he developed currents of quantity as constant as those of a galvanic battery.

These effects had not been reached before, and to this American belongs the credit of inventing the constant-current generating machines.

It was tried successfully for operating telegraph lines in 1845, and gave currents equally as good as those derived from galvanic batteries. Although the machine used was turned by hand, it would charge an electro-magnet so as to sustain 1,000 pounds, and gnited to white heat large platinum wires—the first-known use of dynamo machine currents for incandescent lighting.

Mr. Page demonstrated by mathematical reasoning that his machine afforded the very maximum of quantity to be obtained by magnetic excitation.

In 1849, Nollet, professor at the Military School at Brussels, made the first magneto-electric machine of such a size as to be available for industrial purposes It was built to decompose water, with a view to use the liberated gases for illumination. Nollet died before his work was entirely finished, but it was continued by his assistant, Joseph Van Malderen, under the auspices of a company of French and English capitalists, known as the "Alliance Company." The machine built by Nollet was elaborated by Van Malderen, and the "unitress," invented by Professor Page, was added to it, an account of Mr. Page's invention having been published in leading European science journals.

The Van Malderen machine was, in general principle, only an enlargement of the Clarke machine, with the Page "unitress" added to take the currents off in one direction, an efficient generator of electric currents, which Van Malderen used for the production of light by means of the electric arc, this being the first recorded use of the dynamo or magneto-electric machine current for lighting by the electric arc. It was afterward discovered that for electric lighting the rapidly-alternating current was the most convenient, and the best with the form of lamps then provided.

To American genius is due the credit of the invention of the alternating current magneto-electric machine, and the perfected constant current or dynamo-electric machine, which, even in its first form, has not been excelled by inventors of other countries.

The International Commission of Electricians.

Prof. Rowland, of Johns Hopkins' University, and Prof. Trowbridge, of Harvard University, have returned from the meeting of the Electricians in Paris, to which they were sent by the United States Government in October last.

The Conference failed to reach any important conclusion in respect to the value of the Ohm, but it urged further preliminary investigations, called attention to the methods which appear to be most promising, and advised that governmental aid should be sought in the prosecution of the inquiry. The Conference adjourned to October 1, 1883.

Chemistry of the Electrical Accumulators.

With the attention that is now directed to the storage of electricity, the following description of the *chemical* action of the Plante and Faure accumulator, as given in a German exchange, will not be without interest:

If a plate of lead, coated with a little peroxide of lead, be placed in sulphuric acid, it will soon become covered with sulphate of lead as a result of local currents between the peroxide and the lead, or by simple chemical solution, so that in Plante and Faure's battery the peroxide is gradually destroyed *independently* of the main current. This action takes place very slowly, because the sulphate of lead is deposited between the lead and the peroxide, and hence greatly diminishes the local current. If no sulphate of lead were formed, the peroxide of lead would soon be all consumed. The sulphate of lead is subsequently reduced by the hydrogen, forming spongy lead. By repeated charging, the quantity of finely divided substance increases.

In a similar manner, if two electrodes that are covered with sulphate of lead be immersed in dilute sulphuric acid, and a current passed through them, one will become covered with spongy lead, the other with peroxide formed from the sulphate.

The peroxide formed upon the positive lead plate of the secondary battery becomes covered with a comparatively impenetrable layer which prevents the further production of peroxide; hence Plante leaves his battery at rest, which favors this formation of sulphate of lead.

In this way all the sulphuric acid can easily be taken out of the solution. A considerable quantity of oxygen—will not be absorbed. According to Kabath, the interior plates of lead foil are rapidly crumbled, but the particles remain hanging between the other plates.

Electric Light in India.

The opening of the Sirhind Canal at Rupar on the Sutlej, by H. E. the Viceroy of India, afforded to the Eastern Electric Light and Power Company an opportunity of displaying an installation, consisting of both arc and incandescence lighting, such as has never been seen in India. The camps of the Viceroy, the Lieut. Governor of the Punjab, the Civil and military, and the native chiefs were brilliantly illuminated by forty-eight Brush arc lamps of 2,000 candle power each, from the 22d to the 26th November, and the reception and dining tents of the Viceroy were lighted by thirty-six Lane-Fox incandescence lamps of twenty candle-power, causing intense astonishment in the minds of the many thousand natives who crowded nightly round the engines and dynamos employed in the working—so much so that police had to be employed to keep them back. On the night of the 24th the current used for the lighting of the incandescence lamps was transmitted to lamps lighting the railway station for the departure of H. E. the Viceroy. As soon as his train left the current was returned to his camp. The necessary power was supplied by three 16-light Brush dynamos, driven by portable engines.

A Brush Dividend.—The Brush Electric Light Company, of New England, advertises an extra dividend of thirty per cent, on its capital stock, payable Jan. 15.

Electricity as a Power Transmitter.

From Glasgow we learn that some months ago Mr. Joseph Atkinson, an *employe* of Messrs. Denny, Dumbarton, while engaged fitting zinc sheathing to the shell of the s. s. *Shark* by his patented process, used a Siemens D 7 generator, driven by an ordinary donkey-engine. Through a distance of 150 yards a power equivalent to 6 horse-power was transmitted to a motor near the vessel's side, enabling the work to be expeditiously and economically carried out. The process is, of course, available at any time.

Electric Fairies.

The *St. James's Gazette*, London, corrects some misstatements respecting the "fairies" at the Savoy Theater, who are nightly illuminated by electricity. Each of the fairies is supplied with electricity (generated as required, and not stored) by means of three specially-constructed Plante batteries inclosed in a gutta-percha case. The whole apparatus, which weighs less than three pounds, is worn after the manner of a soldier's knapsack, and is connected with the lamp on the fairy's head by a flexible double wire. This arrangement is the joint production of the Swan and Siemens' companies, but is capable of much improvement in the matters of weight and the number of cells employed. A switch is placed on the top of the battery by means of which the current may be turned off at pleasure; and the light produced is equal to that of six candles. From this it will be seen that the wearer of the lamp runs no risk. There is no current capable of giving a severe shock, and practically there is no more danger from contact with the conducting wires than there is in walking under an ordinary telegraph wire. It seems there was a notion that these "fairies" were lighted by a wire from the main dynamo machine which illuminates the entire building.

We understand that the Winter Electric Exhibition at the Royal Aquarium, London, is shortly to be opened. For this purpose motive power to the amount of nearly 500 horse has been prepared by the direction of the Aquarium, and is being laid down in the buildings specially erected as machine annexes. The body of the hall of the Aquarium will be devoted to arc lighting, which will be represented by fourteen or fifteen systems, of which several are new. The space underneath the galleries, and the galleries themselves, have been subdivided into courts for the purpose of exhibiting the several systems of incandescent lighting and fittings applicable to it. The ground floor of the whole of the building and parts of the galleries are apportioned out to exhibitors for the purpose of displaying the different accessories of electric application, the most notable feature of which will be the motors, in all fourteen in number, which will drive machinery by transmission of power. The dining annex will be lighted by Messrs. Ferranti, Thompson and Ince with 350 incandescent lights, actuated by one of their new dynamos. There is a series of five courts fitted up for the display of the Edison electric light and the different features of the Edison system. All the other courts are occupied by other firms to illustrate either new incandescent lamps or fittings for their use. Thus the whole of the premises of the Aquarium will be occupied for the exhibition, which will very fairly represent all the present systems of lighting and transmission of power. The Metropolitan Brush Company have contracted to light up the Imperial Theater during the course of the Exhibition, and we understand that their installation will be ready by the 6th January. In conclusion, it may be said that the Exhibition promises to be one, not only easily accessible, but at the same time one which will place before the public not only most of the standard systems of electric lighting, etc., but also many new departures of novelty and interest.—*Exchange.*

Technical Schools in Paris.

In 1872 the municipality of Paris established a free public apprenticeship school for the education of workers in wood and iron, which has been so successful that $400,000 has been recently voted for the establishment of similar schools in various parts of the city. The course of study covers three years, and the instruction is divided into general and technical. The general course includes the elements of mathematics, physics, mechanics and chemistry in their relation to industry, also explanations concerning the tools, the materials, the processes and the products presented by the range of practice of the workshops. During the summer visits are paid to industrial establishments, of which the scholars give an account in writing.

The trade instruction in the workshops is subdivided into two courses. In the first the pupils are taught the nature and condition of materials. In the second they pass to actual construction. During the first two years, six hours daily are spent in the workshop and four in the school. In the third year, eight hours are spent in the workshop and two in the school.

The president of the commission having the subject under consideration, in his report says: "In consequence of the virtual abolition of apprenticeship in most trades, and the specialization and subdivision of manufactures from the introduction of machinery, the number of skillful and intelligent workmen in all branches of industry and art manufactures has decreased, and the standard of technical knowledge threatens to be lowered." This he considers would be especially prejudicial to French manufactures, the distinguishing merit of which consists in originality of design. He believes that a remedy for these evils will be found in the establishment of apprenticeship schools, the object of which should be mainly, not the creation of foremen, but the theoretical and practical education of workmen proper. Among the schools to be founded is one for the furniture trades, to form workers in wood, who would become chiefly cabinet makers and upholsterers but also carpenters, joiners, and wood carvers; and workers in iron intending to become general smiths and workers in metal for the same trade, and for decorative purposes.

Units for Measurements.

The metrical unit of *length* is the meter; it is the ten-millionth part of the distance of the equator to the pole.

The unit of *bulk* is the liter; it is a cube of a decimeter side.

The unit of *weight* is the gramme; it is the weight of a cubic centimeter distilled water at 4½° centigrade or 40° Fahrenheit.

The unit of *heat* is the amount of heat required to heat one kilogram of water 1° centigrade.

(The old thus far customary unit is the heat required to heat one pound of water 1° Fahrenheit. As 3° *C.* are 9° Fahrenheit, and one kilogram 2.2 pound, the new unit is nearly 4 old units.)

The unit of *force* is the kilogram-meter, being the force required to raise one kilogram weight one meter high, or the force obtained when letting one kilogram weight descend one meter.

(The old customary unit is the foot pound, being the force required to lift one pound one foot high. As one meter is 3.3 feet and one kilogram 2.2 pounds, the new unit is 3.3 × 2.2 or 7.26 old units.)

The unit of electric resistance is the *ohm;* it is the resistance which a current undergoes when passing through a column of mercury one meter long and one square millimeter section at a temperature of 0° centigrade.

The unit of electromotive force is the *volt*; it is the amount of electro-motive force produced by one Daniel cell.

The unit of intensity is the *ampere;* it is the current produced by one volt through a resistance of one ohm.

The unit of quantity is the *colomb;* it is the quantity of electricity given by one ampere in one second.

The unit of capacity for electric charge is the *farad;* it is the capacity of the condenser which, when charged with one volt, holds one colomb; in other words, the capacity of a condenser which can contain all the electricity which a Daniell cell can give in one second when passing through one ohm resistance.

Value of Electric Light at Sea.

A recognized authority on the subject of ocean navigation assures an evening contemporary which frequently compliments us by adopting our suggestions and publishing them as original, that "the day is coming—and it is not far off, I think—when all vessels pretending to safety and luxury will be illuminated by the aid of electricity only; and then, with incandescent or 'glow' running lights of thirty to fifty candle power, together with a large, powerful arc-light for searching their neighborhood in a fog, the vessels will be much better protected against collision disasters than now."

We are aware that objection has been made by seamen to the use of electric headlights in ordinary weather, but there can be no objection to their use in fogs. According to an authority, an electric headlight should show in a fog, like the sun behind a bank of clouds, nearly an eighth of a mile. He suggests that the light be hooded to prevent a glare in the eyes of the seamen, but the exact device he should recommend is the parabolic reflector, by the use of which a pencil of electric light can be thrown a distance of ten miles in ordinary weather, and certainly more than an eighth of a mile in the densest fog. The *Mail and Express* originated the idea of electric headlights for ships in fogs, and we believe that the time will soon come when every first-class passenger steamship will carry apparatus for the immediate display of a powerful electric light at its masthead whenever it enters a fog at sea.—*Mail and Express.*

The Vienna International Electric Exhibition.

The Electrical Exhibition at Vienna, which was postponed from last year on account of the similar undertaking at Munich, is to be held from August 1 to October 31 of this year, in the Rotunda, and the building erected for the Universal Exhibition of 1873. The exhibits to be admitted are divided into the following classes: I. Magneto-electric and dynamo-electric machines. II. Galvanic cells, accumulators, thermopyles, &c. III. Scientific apparatus, instruments for electrical measurement, electrostatic apparatus. IV. Telegraphs. V. Telephones, microphones, photophones. VI. Electric lighting. VII. Transmission of power. VIII. Cable wires, conductors. IX. Application of electricity to chemistry and metallurgy. X. Application of electricity to war. XI. Railroad electrical appliances. XII. Application of electricity to mining, navigation, and agriculture. XIII. Electro-medical apparatus. XIV. Application of electricity to automatic registration, to horology, meteorology, astronomy, and geodesy. XV. Miscellaneous. XVI. Application of electricity to domestic use, to art, industry, and decoration. XVII. Application of machinery to electrical industry, boilers, steam, gas, and hydraulic engines. XVIII. Historical collections, methods of instruction, bibliography.

To organize and manage the Exhibition a general commission has been formed, which has secured the necessary means by a guarantee fund. This general commission has formed among its members several committees, including a managing committee which is to carry out the resolutions of the remainder, and to be the medium of correspondence with the representatives of foreign countries, and with exhibitors and their representatives.

Applications for space should be in the hands of the Managing Committee, 9, Wallfische, Vienna, at the latest by March 1st, from whom an answer may be expected within fourteen days. Exhibitors will pay no rent, and incur no expense beyond the erection and decoration of their stalls. Motive power will be applied to such as require it at 5d. per horse-power per hour.

The Exhibition will be open to the public both in the daytime and the evening every day, and all exhibits must be always accessible to the public during the regular hours of admission.

The General Commission has taken the necessary steps to enable inventors to enjoy the advantage of the patent laws from the time of the entry of their goods to the exhibition grounds until exit therefrom, and to enable foreign exhibitors to enjoy exemption from duty in case of the re-export of their goods before the end of the year 1883.

No prizes will be awarded by a jury, but a technical and scientific commission will be organized to carry out measurements and investigations in co-operation with the exhibitors.

Electricity vs. Gas.

Amongst the great arguments in favor of the electric light are those of the absence of noxious vapors, its cleanliness, and other matters of a like character. All such facts as these are admitted, we believe, by its greatest opponents, but we should not be surprised that the *bad* effects of gas, its opponent, will be made more apparent during the course of the Electrical Exhibition at the Crystal Palace than even the adherents of the electric light had anticipated. We hear that a considerable amount of damage has already been done to the plants in the Palace, and that the closing of the gas exhibition is seriously contemplated. This we give for what it is worth—it may or may not be true; we hope the latter is the more correct, as it would be a serious loss to all interested in lighting improvements should this interesting collection of gas apparatus be prematurely withdrawn Such a course, should it be necessary, would be the more regrettable seeing that the electric lighting part of the exhibition is in such a backward state. No doubt a considerable amount of information has already been obtained as to what effect such a voluminous display of gas lighting has had upon the artistic belongings of the Crystal Palace, and it will be most interesting to learn the result; for upon it will probably hang a very important argument as to the most effective manner of lighting large spaces when the matter of health and cleanliness enters into the question.

The subject of the comparative cost of the two illuminants has been discussed over and over again; and we have in our pages from time to time shown that even in isolated installations gas, used in a gas-engine for producing motive-power, would give more light when converted into electrical energy than by using it directly as a lighting medium. Therefore the argument of those who are connected with gas interests, that even should the electric light be available to householders at the present rate of gas, then the gas companies could lower their prices to a considerable extent and yet make a good profit, is really a point in favor of the electric light, for if we can get gas at a cheaper rate than it is now supplied for, we could reduce in proportion the price of the electric light, using the gas for motive-power.—*Electrical Review.*

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Score One Point for the Review.

With the current issue, the first year of the life of the REVIEW OF THE TELEGRAPH AND TELEPHONE expires.

On February 15th, 1882, we made our bow, and indicated our line of march, and on February 1st, 1883, we look back and find that we have conscientiously adhered to that line, and we propose to continue so to do if it "takes us all summer."

We then recognized the want of a live, enterprising journal to represent the telephone, telegraph and electric light interests as a distinct line of business, and we proposed to fill the gap. We have faithfully endeavored to keep our readers informed as to the most important and valuable inventions in all branches of electrical science, and while aiming to furnish substantial and valuable information, we have invariably attempted to do so in a colloquial and racy style, to treat weighty subjects with such delicacy as to render them palatable to every one, and to serve up our solid food with such dainty sauce that the most squeamish stomach could readily digest it.

We may not always have achieved this aim; for we have found our experience in this matter to be very similar to that of Mark Twain, who found it impossible to confine himself to the realm of fancy, because facts stewed out of him as naturally as "otto of roses out of the otter."

We have necessarily found ourselves drawn closer to the telephonic half of our title, by the attraction of gravitation, but this is a natural result of the greater desire of the telephonic fraternity to go ahead and to keep ahead.

Yet in all matters of general interest to telegraphers we believe our columns to have been well supplied.

The electric light, in its numerous phases has not been neglected, and we have to the extreme of our ability aided the cause, and ever advocated and chronicled the rise and progress of this most interesting and valuable application of electrical energy.

We have not forgotten the successive developments in generating machines and secondary batteries, but have kept our readers *au fait* in all such matters, from the Brush and Faure improvements to the wonderful economy and sweet simplicity of the Bennett fruit-can battery.

In the telephonic and electric light fields we modestly believe that we have measureably achieved a success.

Some of the best writers in this branch of electricity devote the products of their pens exclusively to our columns, and we believe that we have reason to felicitate ourselves on the scope, brilliancy and general excellence of our articles on those subjects in the past.

During the succeeding year we purpose the continuance of our present policy in this direction. We propose to adopt as our motto "The best that can be had," and to provide for our readers a still more enjoyable, instructive and piquant array, not only of telephonic and electric light information, but also scientific, practical, financial and statistical news of exceeding interest.

Telephone Statistics.

When the American Bell Telephone Company made its last annual report there were in use 189,374 telephones of all classes.

The current rate of increase last year we understand, was nearly 5,000 per month, and last December the total number of instruments in the hands of licensees was over 225,000.

The rate of increase appears to have become normal at a figure of between four and five thousand a month.

At last reports, the cities named had a telephonic population as follows:

Cleveland	1,290
Albany, over	1,000
New Orleans	850
Boston	1,330
Providence and District	2,061
Worcester	826
Lowell	950
New Bedford	550
Baltimore	1,085
Salt Lake City, upwards	360
Minneapolis	675
St. Paul, over	400
Utica	450
Hartford,	700
St. Louis	1,015

Consolidation has reduced the number of companies operating greatly, and in New England there are now but three or four individual concerns, these boing more or less intimately connected with one another.

At the beginning of 1883 there were in operation 793 exchanges, operated by 169 separate organizations.

The Bell patents are to-day stronger than ever, having been successively sustained by Judges Blatchford, Lowell, Nixon, and Justice Gray of the U. S. Supreme Court, who has within a few days ordered a preliminary injunction against the Dolbear Telephone *et al.*

Reduction of Telegraphic Rates.

On January 20 the Western Union Company made twenty-five cents its maximum rate for a message of ten words between any of its offices in New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York city, and the south-eastern part of the State of Maine. Orders have already been given to reduce the present rates of thirty, thirty-five, forty, and fifty cents to the twenty-five cent rate.

The Bankers' and Merchants' Telegraph Company completed its line between Philadelphia and Washington on the 20th inst., and on February 1 will open for business for all of the principal points between this city and Washington. Its system will then consist of ten wires between this city and Philadelphia, which have been operated for several months, and four wires between Philadelphia and Washington.

We learn that Mr. R. S. Guernsey, who has for several years held a responsible position in the law department of the Western Union Telegraph Company, has resigned to take charge of the law department of the Mutual Union Telegraph Company. Mr. Guernsey has been for some time past the editor of the *Journal of the Telegraph*.

The price of American Bell Telephone stock, on January 23, 1883, reached 200, and on Wednesday, 24th instant, after the result of the Dolbear suit was made public, $228.

The telegraph announces the death, in Bellefontaine, Ohio, January 21, of Dr. Edward H. Knight, the well-known author of Knight's Mechanical Dictionary. A notice of the fourth, or supplementary volume, appeared in our issue of September 1.

Subscribers who do not receive the index to vol. I, with copy of this issue, will oblige by notifying us. This edition closes the volume.

More Telephone Statistics.

The following statistics will give a fairly clear idea of the growth of the telephone business in England and Scotland during the year last past. These exchanges are owned and operated by the National Telephone Co., 11 Queen Victoria street, London.

STATEMENT OF SUBSCRIBERS.

Stations.	Subscribers on July 31, '81.	Subscribers on July 31, '82.	Subscribers on Oct. 31, '82.
Glasgow	523	681	695
Greenock	33	63	65
Paisley	3	17	19
Edinburgh	171	216	224
Kirkcaldy	*nil*	7	21
Aberdeen	"	18	26
Dundee	} 15	} 27	} 78
Forfar	}	}	}
Belfast	133	207	231
Leeds	79	129	147
Bradford	67	178	201
Huddersfield	*nil*	40	46
Halifax	"	13	20
Dewsbury	"	26	45
Birmingham	71	138	145
Wolverhampton	19	31	37
Walsall	*nil*	9	26
Nottingham	"	88	105

The Oriental Telephone Company also make a showing of fair progress as follows:

At Alexandria they have 94 regular subscribers, 21 Government subscribers, and had January first applications from 17 more, or altogether 132. At Cairo they have 60 subscribers. Bombay, before the sale to the local company, contributed 81, Calcutta 108, Madras 34, Rangoon 36, Kurrachee 15, Colombo (Ceylon) 30, Singapore 70, Hong Kong 75, and Shanghai 73. At Honolulu the company have more subscribers than at any other exchange, viz., 289, which gives them a grand total of 943.

Important Telephone Decision.

BOSTON, January 24.—A decision rendered by Judge Gray in the Circuit Court here to-day against the Dolbear Telephone, and the consequent injunction granted against it as asked for by the Bell Telephone Company, is the culmination of a long litigation, and is considered an essential victory by the Bell Telephone Company. Judge Gray takes the following grounds:

"That Mr. Bell was the first inventor who successfully used the electric current for the transmission of articulate sound. The differences of Dolbear's and Bell's plans are not such as to warrent the former to claim an invention of the entire system. The essence of Bell's invention consists not merely in the form of apparatus which he uses, but in the general process, or method, of which that apparatus is the embodiment. Notwithstanding the distinct difference claimed by the Dolbear receiver, they avail themselves of Mr. Bell's discovery that undulatory vibrations of electricity can intelligently and accurately transmit articulate speech as well as of the process which Bell invented and by which he reduced his discovery to practical use. They also copy the mode and apparatus by which he creates and transmits the undulatory electrical vibrations corresponding to those of the air. And in the plate charged with electricity which they have substituted for the magnetic coil in the receiver the charge constantly varies in accordance with the principle which Mr. Bell discovered, and by means of the undulating current caused by the process and in the mode which he invented and patented. The defendants have therefore infringed on Bell's patent by using his general process, or method, and should be restrained by injunction from continuing to do so."

The Chemistry of Secondary Batteries.

Soon after the meeting of the British Association at Southampton, we gave an abstract of a paper read by Dr. Gladstone, before Section A, in which the author related his recent researches on the chemical reactions in secondary batteries with special reference to local action. Dr. Gladstone had ascertained that the local action which corrodes the lead plate supporting the peroxide of lead thus impairs the value of the battery, took place during the formation of the battery, during the repose and during the discharge, and that it therefore becomes an important question to determine what modification of the present arrangements would minimise, or if possible altogether prevent local action. Dr. Gladstone presumed that the sulphate of lead formed in the secondary batteries could be oxidized as well as reduced, to yield peroxide of lead in the former and spongy lead in the latter case, and thus to re-establish the initial state of the battery. The possibility of an oxidation of the sulphate of lead was not doubted; but Sir William Thomson hesitatingly remarked that he had only been able to obtain a very spurious reduction, whilst Professor Oliver Lodge had totally failed in realizing any reduction of the lead sulphate. As the possibility of this reduction was one of the fundamental points of Dr. Gladstone's explanation, both he, in connection with Mr. A. Tribe, who has always shared Dr. Gladstone's researches in this field, and Professor Lodge, repeated their experiments, and the same number of *Nature* brought communications from the two gentlemen, according to which both adhered to their former statements and opinions. We have mentioned that the question had also occupied Sir William Thomson, who, experimenting with two platinum plates coated with sulphate of lead, making the one the positive, the other the negative electrode, had clearly observed the oxidation of the sulphate on the former, but only found a doubtful indication of a reduction on the latter electrode, though the action had been continued for six weeks. In his subsequent researches, Dr. Gladstone similarly attached 20 grammes of the white sulphate of lead to the negative plate by binding it round tightly with parchment paper, and passed a continuous current of somewhat under one ampere, through the dilute sulphuric acid in which both plates were suspended vertically. The greater part of the hydrogen generated at the negative plate was noticed to escape, but after the lapse of twenty-four hours the gray metallic lead became distinctly visible through the wet parchment, and at the end of ten days the whole of the sulphate, with the exception of a few small patches, was found to have been reduced to a gray spongy metal. To meet any objection, Dr. Gladstone convinced himself by analysis that the spongy mass was really nothing but lead. After this, Dr. Gladstone thinks that the reduction of the sulphate of lead must be acknowledged as an absolute fact, although it does not take place so easily as the oxidation. It is difficult to harmonize with these observations the report of Dr. Lodge, who recommenced his experiments with a view to ascertain, not whether the sulphate of lead was reduced in bulk by the nascent hydrogen, a point on which he had satisfied himself before in the negative, but whether any traces of metallic lead could be obtained on the negative plate.

Dr. Lodge immersed platinun electrodes in a paste of sulphate of lead, the two electrodes being about 2 inches apart. The paste was, at the suggestion of Professor McLeod, obtained by precipitating with sulphuric acid dissolved, carbonate of lead, to secure a fine state of subdivision. When three Lechanché cells were used, the evolution of gas from both plates was powerful enough to form a halo round each, filled with only turbid liquid; but both plates showed a distinct but extremely thin coating of peroxide and metallic lead respectively. When, to avoid the strong evolution of gas, two cells only were used, the growth of peroxide was abundant, but the formation of metallic lead on the negative plate was even less perceptible than before, and it appeared that the metallic lead was better deposited from the liquid above the paste, than from the paste itself. Still, when electrolysing a clear solution of sulphate of lead in dilute sulphuric acid, the solution being concentrated as much as possible with so insoluble a body as sulphate of lead, no effect could be perceived. The experiment was then a little modified by dipping the platinum plates into the clear liquid above the paste, barely letting them touch the mass; then the negative plate appeared distinctly blackened, whilst the positive one hardly received any deposit of peroxide except along its bottom edge. These observations agree with the results of previous experiments of Professor McLeod. The possibility of a reduction is evident, but it can be of no practical value if the deposit of one week could be dissolved in one drop of nitric acid, and if this solution gave no more than a faint precipitate with sulphuric acid. One might attempt to get over the apparent contradiction in these two statements by supposing that Dr. Gladstone was more successful because he secured a close contact between the electrode and the sulphate coating, while in Dr. Lodge's arrangement, the gas bubbles kept the sulphate particles away from the platinum plate. But some of Dr. Lodge's observations do not admit of this interpretation, and we can hardly assume such conditions to correspond to those in a secondary battery in which the supposition of a reduction seems almost unavoidable.—*Engineering.*

MM. Bertrand and Du Moncel have verified the law formulated by M. Marcel Duprez, namely: 1. The intensity of an electric current remaining the same; whatever be the speed of the motor the static effort does not change. 2. In a machine worked by a current the speed may be doubled, quadrupled, or decupled without the intensity of the current varying. During the experiments the resistance of the circuit had been varied without changing the intensity of the current.

It would seem that it is quite possible that the long-talked of postal telegraph may be a thing of the very near future, if the following bill, which was introduced in the House of Representatives on the 8th of January by Mr. Anderson, should become a law. For the information of those who may not have read it, we append it in full herewith:

Mr. Anderson introduced the following bill:

A BILL

To create the postal telegraph of the United States:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That to promote the public convenience by furnishing facilities for a more rapid transmission of intelligence than is possible by mail, the Postmaster-General is hereby authorized to establish, construct, and maintain, under such rules and regulations as he may prescribe, and as a part of the postal system of the United States, a telegraph line between Portland, Maine, and Topeka, Kansas; the trunk line to run from Portland, via Boston, Providence, Hartford, New Haven, New York, Philadelphia, Harrisburg, Pittsburg, Columbus, Indianapolis, Springfield, Saint Louis, Jefferson City, Kansas City, and Lawrence, to Topeka, with branches as follows: From New York City, via Albany, Syracuse, and Rochester, to Buffalo; from Philadelphia, via Baltimore and Washington, to Richmond; from Pittsburg, via Cleveland and Toledo, to Detroit; from Columbus, via Cincinnati, Lexington, and Louisville, to Nashville; from Indianapolis, via Chicago, to Milwaukee; from Saint Louis, via Quincy and Keokuk, to Burlington, Iowa; from Kansas City,

via Leavenworth, Atchison, and Saint Joseph, to Omaha.

SEC. 2. That the Secretary of the Treasury is authorized to issue, as hereinafter provided, bonds of the United States, in the amount of one hundred dollars each, and not exceeding an aggregate value of three millions of dollars, redeemable in lawful money of the United States within twenty years, and payable within thirty years from date of issue, bearing interest at the rate of three per centum per annum, payable in lawful money of the United States, at the subtreasury in the city of New York, on the first day of January and of July. When notified by the Postmaster-General that within thirty days thereafter the postal telegraph will need a stated sum of money, not to exceed three millions of dollars in amount, the Secretary of the Treasury shall cause to be offered, in open market, in the city of New York, and after five days' public notice, a sufficient number of said bonds to realize the sum stated. Each of said bonds shall be sold separately, to the highest cash bidder, at not less than par, and shall only bear interest from the date of sale, the interest for the period between said date and the first day of January or July next ensuing being paid to the buyer on delivery of the bonds; and the proceeds of said sales, including premiums and deducting said interest, shall be placed to the credit of the postal telegraph. In making such notification the Postmaster-General shall indicate approximately the sum needed, and when required, and during the first five years from the establishment of the postal telegraph, he shall hold in reserve and unissued a sufficient number of said bonds with the proceeds of which to meet the interest to accrue upon bonds then issued, unless in his judgment the profits of the business of the postal telegraph will meet said interest, when he may cause said bonds to be sold. And on or before the expiration of said five years the Secretary of the Treasury shall reimburse the capital of the postal telegraph, from the profits thereof, to the extent that the proceeds of said bonds may have been used in the payment of interest; nor shall said capital be thereafter diminished, except as follows, namely: During the twentieth year from the issue of the first of said bonds, and during each succeeding year until all of said bonds shall have been redeemed, the Secretary of the Treasury shall take three hundred thousand dollars of the postal telegraph funds and therewith redeem an equal par value of said bonds, which latter he shall cancel and destroy. He shall also place to the credit of the postal telegraph all sums received from the sale of telegraph stamps, after all current expenses of repairing, maintaining and operating said telegraph have been deducted therefrom, under rules and regulations to be prescribed by the Postmaster-General. And he shall pay the funds credited to the Postal telegraph on the warrant of the Postmaster-General.

SEC. 3. That the Postmaster-General shall appoint a suitable person, to be known as the superintendent of the postal telegraph, who shall have charge of the same, and shall receive an annual salary of three thousand dollars. He shall also appoint an electrician, who shall receive an annual salary of two thousand dollars.

SEC. 4. That said line shall be constructed of the best materials, built thoroughly and durably, equipped for the greatest utility and efficiency, and shall be first-class in every respect and appointment. When the word "line" is used in this act it shall be construed as including the branches thereof above specified, and such branches and extensions as may hereafter be built. The Postmaster-General shall prescribe plans and specifications for the construction of said line, and after proper notice may receive proposals and enter into contract, with the lowest responsible bidder, for the construction of a section of line consisting of one hundred consecutive miles, which shall be completed within six months from the date of contract. The same contractor may build more than one section, provided each of the sections taken by him shall be completed within six months of the date when the first letting of sections named in that notice to builders is made. But if the Postmaster-General shall find that said line, or any part of it, can be built at less cost to government, with equal thoroughness and sufficient expedition, he may request the Secretary of War to cause the work to be performed by the Signal Corps of the United States Army, who is authorized to grant the request. The poles shall be of cedar or other durable wood, not less than forty feet in length, and having a capacity for twenty-four wires, not more than twelve of which shall be strung at the time of construction. Nor shall the cost of any section of said line be greater than at the rate of five hundred dollars per mile for a line of six wires, except as to such portions thereof as cross mountains or such as require cables for crossing streams or bays. And if, in his judgment, and after due investigation, a line composed of insulated wires laid under ground will be more durable and efficient than the one above indicated, and if the original cost thereof will not be twenty-five per centum greater than that of the above line, he may construct such underground line. After proper advertisement, at his discretion, he shall let the contract or contracts to the lowest responsible bidder or bidders for furnishing such instruments, material, or other appointments of the line as he may specify.

SEC. 5. That he shall cause said line to be constructed along or across any street, road, canal, railroad, or other public highway that he may designate; nor shall any person or corporation be allowed damages or rental for the right of way of said line, except where the same shall not be upon a public highway.

SEC. 6. That local offices of the postal telegraph, which may be designated "stations," shall only be established in a post-office of the United States, and shall be a part thereof, and under the immediate control of the postmaster; nor shall the operation of a local office interfere with the prompt distribution and delivery of the mail. The expenses of a station which may be charged to the postal telegraph shall be as follows: First. The wages of operator or messenger exclusively occupied as such. When such service is partly telegraphic and partly general, the proportion of wages chargeable to the postal telegraph shall be the proportion which the total value of telegraph stamps canceled bears to the total value of postage stamps canceled during that quarter. Second: Cost of instruments and cost of making and maintaining connection with the line; but no allowance shall be made for rent, heating, or lighting office, or for furniture. A station shall be established in each post-office on the line having the carrier system, and may be established in any post-office near the line, upon the execution by the postmaster thereof of a good and sufficient bond to pay the postal telegraph annually any excess of the current expenses of said station over the amount of telegraph stamps canceled during that year. When the compensation of a postmaster who has executed such a bond is based upon the value of postage stamps canceled, his compensation shall be determined in like manner by including the value of telegraph stamps canceled. During the first year of the operation of a station the Postmaster-General may, in his discretion, pass, quarterly, to its credit an amount additional to the total value of telegraph stamps canceled, as follows: To a station in post-offices of the second class, ten per centum of the value of telegraph stamps canceled; in post-offices of the third class, twenty five percentum; in those of the fourth class, fifty per centum; and during the second year an amount determined by one half of these rates, respectively. But such allowances shall only be made to a station during quarters when the current expenses are greater than the receipts, and only within two years from the date of the establishment of the first station in that post-office.

SEC. 7. That the Postmaster-General shall cause to be issued a peculiar stamp, to be known as telegraph stamps or "graphs," of such character as he may deem expedient. And no written message, except it pertain to the business of the line, shall be transmitted without such a stamp affixed thereto, in like manner as are postage stamps to letters. Telegraph stamps shall be procured, distributed, sold, used, and canceled in the same manner as are postage stamps. Such government messages as might be legally sent through the mails in a penalty envelope may be transmitted over the line when a penalty telegraph stamp has been affixed; and until the postal telegraph shall have been extended to the Gulf of Mexico and to the Pacific ocean, Congress shall annually appropriate to the postal telegraph, at one-fifth of regular rates, compensation for the messages bearing penalty stamps sent by it during the previous year.

SEC. 8. That the rates for the transmission of messages, except as above designated, shall be twenty-five cents for each ten words or less, exclusive of address and signature, and twenty-five cents for each additional ten words or less. But the Postmaster-General may, at his discretion, temporarily or permanently, modify these rates so as to conform to any less rates which may be charged between competing points by competing telegraph or telephone companies or lines; and he may establish and operate telephone lines between main and sub-postoffices in the same city, or in adjacent cities, or between any station and patrons who pay the cost of such lines or furnish their own lines.

SEC. 9. That messages for transmission by the postal telegraph may be forwarded to stations or from stations to other post-offices in a penalty envelope, and postmasters may inclose therewith in postage stamps the charge for transmitting such message.

SEC. 10. That the Postmaster-General may extend the line as rapidly as the funds in the Treasury to the credit of the postal telegraph will fully pay the cost of construction and equipment. In determining upon such extensions he shall be solely governed by the relative importance and cost thereof, said importance to be ascertained by a comparison of the total value of postage stamps canceled during the four preceding quarters at offices of the first, second, and third classes upon the respective extensions contemplated, the object of the line being to furnish the greatest accommodation to the largest number of the people at a given cost.

SEC. 11. That laws governing the postal service shall apply to the postal telegraph, except so far as they may be in conflict with the provisions of this act or of proper rules and regulations made by the Postmaster-General for the execution of the purposes of this act.

The French and the Direct Cable companies are to open an office at 40 Broadway, for the transaction of business with other land lines than those of the Western Union Telegraph Company. This arrangement is made with the approval of the Western Union Company, and, according to its officials, is not a violation of the contract between that company and all of the cable companies. It is understood that this step has been taken in connection with the abandonment of the scheme to lay an additional cable or cables.

The eight cables now laid between America and Europe have an aggregate share capital of $64,000,000. The contemplated new cable will cost $2,200,000. The average cost of the older cables was about $2,500,000, and they are thus compelled to carry $44,000,000 of watered stock, and cannot pay dividends on a 25 cent tariff. Five of the eight cables are old, and may require replacement at any time.

The Tropical American Telephone Company, limited, organized in November, 1881, under the laws of the State of New Jersey, with a capital of $400,000, divided in 40,000 shares. It acquired from the Continental Telephone Company of Boston (the assignee of Professor Alexander Graham Bell, Francis Blake, Watson, Anders, Roosevelt, Fuller. *et at.*, all telephonic rights, formerly its property in Central America, United States of Colombia, Venezuela, British, Dutch and French Guiana, Chili, Peru, Ecuador and Bolivia, South America and all the West India Islands, except Cuba (already ceded to the Cuban company). By recent purchase this company has obtained from the Continental Telephone Company all its existing telephonic rights in the remaining countries of South America, including many valuable contracts with subsidary companies; and now has the sole and exclusive right, for a term of years, to sell, lease and use "Bell" Telephones, "Blake" Transmitters, and all other telephonic apparatus manufactured by the American Bell Telephone Company, under patents owned or controlled by it in the United States and Canada, in the entire territory of South America, Central America, the West Indies and Mexico.

This company now becomes the parent company and source of supply to the following telephone companies already organized and doing business, viz:

1. The Central American Telegraph and Telephone Company, controlling Central America and Panama.
2. The Colombia and Venezuela Telephone Company, controlling United States of Colombia and Venezuela
3. The West India Telegraph and Telephone Company, controlling Jamaica, Porto Rico, Hayti, San Domingo, &c.
4. The Compañia Electrica de Cuba, controlling the Island of Cuba.
5. The Mexican Telephone Company, controlling the republic of Mexico.
6. The Companhia Telephonica de Brazil of Rio de Janeiro. This company was sold by the Continental to Brazilians for $80,000 in gold, after an outlay of $30,000.
7. The Telephone Company of Brazil, operating in Bahia, Pernambuco, Santos, Rio Grande, and elsewhere in Brazil.
8. The United Telephone Company of the River Plate of Buenos Ayres, controlling the Argentine Republic, Uruguay, and Paraguay. The Continental Company spent $100,000 in the plant.
9. The Chilian and West Coast Telephone Company, controlling Chili, Peru, Ecuador, and Bolivia. This company owns an exclusive concession for the Edison telephone system and now adds the "Bell" into the city service.

Nos. 1, 2, 3, and 9 are legitimate offshoots of the Tropical Company in which it has a stock interest of one-fifth part. Nos. 4, 5, 6, 7, and 8 are children of the Continental now adopted by the Tropical Company.

Besides several telephone "Exchanges" in Barbadoes, Guianas, and elsewhere, operated by the Tropical American Company, and will supply the "private line" telephone business throughout the entire territory under its control. Its officers are: F. M. Delano, of New York city, president; J. H. Howard, of Boston, vice-president; J. D. Haines, of New York, secretary and treasurer. Directors, F. M. Delano, of New York; Nathan Appleton, of Boston; Charles W. Jones, of Boston, treasurer Continental Company; J. D. Haines, of New York; Charles Williams, Jr., of Boston (licensed manufacturer of American Bell Company's instruments); J. H. Howard, of Boston; S. T. Wyatt, of New York.

The Tropical Company has received orders for six hundred complete sets of instruments from Brazil since the recent acquisition of territory, upon which it realizes over $5,000 profit.

It has also shipped one hundred sets to the West Indies within the month, to supply its own exchanges there, and its business is taking on the appearance of rapid growth and good profit.

The Mexican Pacific Telephone Company was organized Jan. 11, 1883, under the laws of the State of New Jersey, with a capital of $150,000, divided into $15,000 shares of the par value of $10 each. This company will do a general telephone business in the States of Sonora, Sinaloa and Colima, also in Lower California and the District of Tepic in the State of Jalisco, under licenses from the Mexican Telephone Company. It has exchanges already established at Guaymas, Hermosillo, Mazatlan and La Paz, and will soon have others in Colima, Tepic and other cities and towns. The directors are E. B. Welch, Alexander L. Hayes, Charles Williams, Jr., Leavitt Hunt and Isaac S, Taylor. E. B. Welch is president, Alexander L. Hayes, secretary and treasurer. L. E. Allen, of Mazatlan, is general manager.

Long Distance Telephones.

Experiments in talking over long distances were made recently in the office of the Mutual Union Company, 135 Broadway, when conversation was carried on easily first with a ground circuit and a Hopkins telephone between New York and Westfield, Mass., by way of Danbury, Hartford and Springfield, a distance of 160 miles. Another wire by way of Albany, was introduced, and instead of grounding the wires a metallic circuit was used, thus getting rid of induction disturbances. With a circuit measuring 400 miles in distance, conversation was carried on with equal ease. Experiments are to be made this week with a wire between here and Buffalo, giving, with return wire, a distance of nearly 1,000 miles.

A Royal Subscriber to the Telephone Exchange.

Ajuda Palace, the town residence of His Majesty Don Luiz, I., King of Portugal, was early this month connected to the public telephone exchange in Lisbon, Don Luiz thus being the first European monarch who has had a telephone line to a public exchange. The majority of the ministers are already connected to the exchange from their respective *Gabinetes*, as well as the Civil Governor, General Commander of the Military Division, Municipality, and the Commander of the Municipal Guard, to which last His Majesty first spoke, in order to try the telephone, with which he expressed his complete satisfaction and surprise, as "the voice of the general seemed to come from inside the case," as also with the elegant appearance of the instruments, which consist of a Gower-Bell and magneto call mounted on a backboard, the whole being specially got up in black and gold by the Telephone Construction and Maintenance Company. His Majesty honored Mr. H. S. Samuel, the manager of the company, and Mr. A. Danvers, the company's engineer, with an interview on the occasion, during which the telephone and the way it is used were explained to him.

The National Capitol Telephone Company of Washington has been somewhat reorganized recently, the new board of directors is composed of the following well-known gentlemen: H. S. Cummings, C. C. Glover, H. D. Cooke and Gardiner G. Hubbard of Washington, A. P. Sawyer, of Newburyport, Mass., H. B. Lytle of Boston, and H. P. Frost, of New Haven, Ct. H. S. Cummings, President, and H. D. Cooke, Treasurer. The stock of this company is now in hands of the above named parties, who are nearly all practical telephone men, and its success is assured.

The Telephone in Rotterdam (Holland).

The first telephone list of the Dutch Bell Telephone Company for the city of Rotterdam has appeared. It shows that nearly 300 subscribers are connected. It was the skillful engineer, Mr. J. M. Seymour, Jr., of Newark, who took charge of the business in March, 1882, and, considering that much cable and pole work had to be done to take in a great many of the subscribers, we must confess that a great amount of work has been finished in a short time. It was also Mr. Seymour who introduced the iron fixtures here; besides, he adopted a splendid scheme for killing the noise of the wires, and only for this system many permissions for fixtures would have been refused which were now granted. The inside of the Central Office looks nice. Thirteen Gilliland switch boards are placed there; the tower is a model; no wild cat business of any kind, for four sides of 250 wires each give place for the connection of 1,000 subscribers. The poles, with iron curls to hold the iron cross-arms together, look splendid, and so do the cable boxes.

We know that the Dutch Bell Telephone Company owes much to Mr. Seymour. He departed for the United States January 3d. Good luck to him! V.

Suburban Telephone Company, Boston, Mass.

A telephone test was made last Sunday over the wires of the suburban and auxiliary companies between the office in Hancock square, Charlestown, Mass., and the Soldier's Home at Tagus, Me., a distance of about 230 miles over the wires, and is considered a remarkable performance by the telephone people. Connections were made through the following offices: Somerville, Woburn, Salem, Haverhill, Exeter, Portsmouth, Biddeford, Portland, Bath, Augusta, and Tagus.

The stockholders of the Midland, Western, and Central Telephone companies met in Chicago on January 17, and elected directors as follows:

Midland—Messrs. Anson Stager, Theo. N. Vail, George L. Phillips, Norman Williams, R. C. Clowry, John M. Wheeler, D. H. Louderback, A. J. Caton, E. M. Barton, M. G. Kellogg, L. C. Tallmadge, E. P. Wright, John L. Thompson, John Crear, C. R. Cummings.

Western—Messrs. Anson Stager, R. C. Clowry, Norman Williams, D. H. Louderback, M. G. Kellogg, E. T. Keine, George L. Phillips, William Renwick, J. F. Wadlick, Theodore N. Vail, S. G. Lynch.

Central—Messrs. Anson Stager, R. C. Clowry, Norman Williams, M. G. Kellogg, D. H. Louderback, C. H. Brownell, L. C. Tallmadge, A. J. Caton, John F. Wadlick.

The total amounts of the dividends of the various telephone companies whose headquarters are at Lowell, Mass., for the quarter ending December 31, were as follows:

National Bell of Maine	$18,288
Boston & Northern	13,500
Suburban	7,000
Bay State	11,200
Union	1,500
Grand total	$51,488

In the Metropolitan Telephone Company we notice the following promotions this week: P. K. Dumaresq, formerly purchasing agent, to position of acting auditor, and H. P. Copeland, contract clerk, to chief clerk in Vice-President's office. These gentlemen are old experienced telephonists and deserving of advancement.

Electric Sparks and Electrostatic Actions.

The following is an abstract of a paper by M. Aug. Righi in the *Comptes Rendus*, published in a recent issue of the *Phil. Mag.*:—"Known experiments show that the electric discharge commences when the electric density on the electrodes has attained a sufficient value relatively to the dimensions of the balls, their quality, distance, &c. Supposing that the discharge is constituted by the emission of electrified particles, it will commence at that one of the two electrodes on which the density is the greater—from which we derive the explanation of many phenomena. If, then, at but little distance from the place where the spark is formed there are other electrified bodies, the particles will deviate from their path, moving away from the bodies which have charges of the same name as that of the electrode which repels them, and approaching the bodies charged with the contrary electricity. Now, the spark must pursue the path of the first particles repelled; for, by reason of the heat evolved, it offers less resistance. Therefore, the spark itself will deviate, as if it were a body charged with electricity of the same sign as that of the electrode on which the density previous to the discharge is the greater. The following is one of the ways in which I have verified this class of facts:—The two stems bearing the discharge-balls are arranged vertically one below the other, and at equal distance two parallel vertical discs are kept constantly charged, the one with positive, the other with negative electricity, by a Holtz machine with auxiliary combs, the exciters of which are sufficiently distant from one another for the sparks not to explode.

It is readily observed that, when the two discs are not charged, the form of the spark produced between the two stems by the discharge of a condenser charged by another Holtz machine is nearly a straight line (if the distance between the balls is not too great); but if the discs are charged, and if the two balls are not in all respects identical, the spark is curved, approaching the one or the other disc. The changes of shape are very remarkable when a liquid resistance, such that the spark becomes yellow, is inserted in the discharge-circuit. The spark then takes very curious forms, and at the same time it is observed to start from points of the electrodes situated laterally. Suppose, for example, that the two balls are identical in dimensions and quality, but that one of them, the negative, communicates with the earth; the greater density is then on the positive ball, and it is there that the discharge will commence. The spark, in fact, is displaced and deformed as a positively electrified flexible body would be. The same effect is obtained if, both balls being insulated, the diameter of the negative is greater than that of the positive ball."

A New Ocean Vessel.

THE "NORMANDIE" THE LATEST ADDITION TO THE FRENCH LINE.

The *Normandie* is the name of a new iron steamship which has just been added to the French Transatlantic fleet. She was built at Barrow-on-the-Clyde, and is intended to ply between Havre and this port. The new vessel is the largest French ship afloat, and is said to be the handsomest of any of her kind. The vessel is 525 feet in length, with a maximum width of 50 feet and a depth of 37 feet from deck to keel. The massive iron hull which, at the bows, runs to a point as sharp as a knife, is vertically divided into ten compartments by heavy iron plate walls or watertight bulkheads. The ship is divided into four decks, an upper and three between. Its power of propulsion is furnished by three engines of 6,600 horse power, and the ship is expected, on her trial trip, to do eighteen miles an hour, and after a few trips, when her machinery runs easy, twenty-one miles an hour will be expected of her. Her masts, of which she has four, are of iron, with steel mounted yards. The plans on which she is built were laid by M. Audenet, an engineer in the French Navy. Above the deck, on a level with the cabin roof, is a spacious promenade for passengers.

Speaking tubes and telegraphic apparatuses are so arranged that the officers can readily convey their orders to the crew and engineer, while by the pressure on a small key, can connect with a steam motor which acts on the rudder gear. The quarters for first class passengers, for whose accommodation 157 sleeping apartments are provided, are all fitted up in the center of the ship, thus relieving them from the discomfort arising from the pitching of the ship and the vibrations caused by the screw. The main saloon extends from side to side of the ship, and is 36x50 feet wide, and is 8½ feet in height. There are sleeping accommodations for 68 second-class passengers and 866 third-class passengers. Two electric generators of 40-horse power each supply electricity with which to light the entire ship. In the saloons and cabins 400 incandescent Swan lamps are used, while 13 large lamps and numerous side lamps furnish light for the rest of the ship. A passenger lying in his bunk has only to reach forth his hand, press a knob, and instantly his cabin is in a blaze of light. The furnishings of the vessel throughout are palatial.

Mr. D. H. Louderback, that pioneer and most efficient and energetic worker in the telephone field since 1878, and to whose sagacity and enterprise may justly be attributed the consolidation and unity of the Bell and Edison interests in this great field in 1879, has, we learn, organized another large Western company to be known as the Central Illinois Telephone Company, with capital of $250,000. Headquarters at Chicago. This, in addition to the Western, Midland and Central Telephone Companies, in all of which he is a director, secretary and treasurer, together with the Western Edison Electric Light Company, of which he is secretary, one would infer that his hands would be full, but we have never seen him yet when he did not have leisure to do some service for his friends. "May he live long and prosper."

The list of telephone subscribers issued by the Omaha Electric Company, on January 1, shows 485 telephones in use in Omaha, 113 in Council Bluffs, 242 in Lincoln, 59 in Fremont, 48 in Plattsmouth, 14 in Blair, and 7 in Arlington. Mr. S. H. H. Clark is president of the two companies, Mr. J. J. Dickey, vice president; Mr. L. H. Korty, secretary and treasurer, and Mr. Flemon Drake, general manager. Mr. John G. Morse is superintendent of the Omaha Electric Company, which operates the Omaha and Council Bluffs exchanges; Mr. Charles Southard being manager of the former and Mr. F. B. Rodefer of the latter. Fifteen cents is charged to non-subscribers for the use of the telephones in public stations in Omaha. Subscribers in either of the towns named can communicate with any of the other towns at rates ranging from 25 to 50 cents, for five minutes' conversation.

In the spring of 1882 suit was brought by the American Bell Telephone Company, against Amos E. Dolbear, *et al.*, for infringement of the Bell patents, and the case was argued in May, by Messrs. Chauncey Smith and J. J. Storrow, for the plaintiff, and Messrs. Causten Browne and Maynardier for the defendant, before Justices Gray and Lowell.

A preliminary injunction was asked. Decision was reserved, and was given January 24, 1883, sustaining the Bell patent in its breadth, as elsewhere noted, at length.

An Electric Dog Trap.

At the Brush Electric Light Station, at the corner of Notre Dame and Front streets, there is a dog trap which is somewhat remarkable, and the effect produced on prowling canines very peculiar. A space on the floor is dampened and one wire from an electric light connected with the wet spot, in the center of which is a piece of meat with the other wire attached to it. A dog entering the establishment is naturally attracted by the meat and approaches it, having to stand on the moist space. The moment he touches the meat the circuit is made and the intruder is thrown some distance by the shock. The other night an Irish bulldog made four attacks on the meat, but had, after a severe shaking, to relinquish his grip on the toothsome bait. The stroke passing over the small wires used is not sufficient to kill, yet it is severe enough to impress the dog with its force, and they rarely return.—*New Orleans Times-Democrat.*

The Value of Industrial Exhibitions.

Says *Iron* (Philadelphia): "Expositions have been very successful in arousing the interest of people, and, no doubt, they will continue to be held, and increase in value and importance. Nothing better could be devised to make known to the world the progress made in our separate industries and departments of activity. They are better than books or colleges, and do more to educate the practical man of the age than any other agency which could possibly be employed."

The Southern New England Telephone Company is constructing a metallic circuit from this city to Boston, the poles having been erected save for a distance of four miles at Greenwich. The wires will be placed twelve inches apart and will form a perfect service, the ground induction, which interferes so much with the local service, being avoided.

The arrangements completed for the Telegraphers' Reception and Ball at Tammany Hall on Friday evening, February 9th, are such as to insure success and a pleasurable occasion. The large number of tickets already sold exceed the anticipations of the committee in charge, who are gratified at the unexpected demand. Application may be made for tickets to the undersigned: S. E French, C. Cunningham, A. J. Voyer, P. Kelliher, J. Mitchell, 195 Broadway, Geo. St. Clair, Stock Exchange.

Speaking of electric railways, Prof. W. E. Ayrton remarks: "When, then, we commit the carrying of our power to that fleet messenger to which we have been accustomed to intrust the carrying of our thoughts, then shall we have railways that will combine speed, comfort, and safety." The range for mechanical invention in electro-motors is very great, and there are honors and riches awaiting the geniuses who may achieve success.

Mr. John Hemmens, one of the most popular and experienced managers in the telephone business, we learn, has quite recently resigned from the service of the Metropolitan Company of this city. We do not think that he will have to look far to find a demand for his services in that field, among those who know him, if he desires to continue in it.

The number of patents issued in the department of electricity from the United States Patent Office during 1882 was 1,153, of which 258 were for electric lighting, 141 for telephonic apparatus and appliances, and 110 for magneto and dynamo-electric machines.

The Northeastern Telephone Company, of Ohio with principal office at New York; capital, $12,000, has just been incorporated.

The Modern Plymouth Rock. Steerage Passengers Landed at Castle Garden During the Past Eleven Years.

The following table of the arrivals of steerage passengers at Castle Garden from European ports was prepared to-day by Captain John E. Moore, Landing Agent, at Castle Garden:

1872	292,844
1873	268,272
1874	149,762
1875	99,903
1876	75,035
1877	63,855
1878	79,801
1879	133,907
1880	320,607
1881	441,064
1882	455,450
Total	2,380,500

We have received a copy of the REVIEW OF THE TELEGRAPH AND TELEPHONE, a journal devoted to the subject of electricity. It contains much interesting and valuable matter relating to the subject, which is attaining such prominence, and is well worth the subscription price of $2.00 a year. Published by George Worthington, No. 23 Park Row, New York.—*The Times.*

The Chief Cities of Europe.

Recently there have been compiled from official and late sources, statistics of population for some of the principal cities of Europe, from which it appears that there are 92 towns in Europe, to which the term city can properly be applied, that have a total population of more than 100,000; but there are only four cities that possess more than 1,000,000 inhabitants. These four are London, with 3,832,440; Paris, with 2,225,910; Berlin, with 1,222,506, and Vienna, with 1,103,110. Of the other capitals, St. Petersburg possesses 876,570; Constantinople, 600,000; Madrid, 367,280; Buda-Pesth, 360,580; Warsaw, 339,340; Amsterdam, 317,010; Rome, 300,470; Lisbon, 246,340; Palermo, 244,990; Copenhagen, 234,850; Munich, 230,020; Bucharest, 221,800; Dresden, 220,820; Stockholm, 168,770; Brussels, 161,820; Venice, 132,830; Stutgardt, 117, 300. In addition to these, Moscow contains 611,970; Naples, 493,110; Hamburg, 410,120; Lyons, 372,890; Marseilles, 357,530; Milan 321,840; Florence, 169,000; Antwerp, 150,650; Cologne, 144,770; Frankfort, 136,820; and Rouen, 104,010.

A terrified Philadelphian has written to one of the papers begging it to use its influence to prevent any further reduction in the price of gas. January, a year ago, he says, with gas at $2 per 1,000, his bill was $19.46; this January with gas reduced to $1.90, his bill calls for $27.06, although he closed two hours earlier this season than last. He hasn't dared to cipher out what it would be were gas reduced to $1.50

A Dictionary of Electricity, by Henry Greer, N.Y. Agent College of Electrical Engineering, 122 East 26th street, New York. Octavo, $3.00. Professor Weston says of it: "It is exceedingly valuable to all interested in electrical science. Leaving out the old glass machine, sealing-wax, amber experiments, &c., &c., and inserting cuts and descriptions of the recent wonderful inventions, makes it exceptionally interesting to electricians and telegraphers. Nearly every electrical inventor and manufacturer in the world will find a description of their invention or apparatus in it."

A Picture Viewed by Electricity.

The experiment of lighting by electricity Philippoteaux's huge painting of the "Siege of Paris" was successfully tried last Saturday evening at the Belgian Panorama Company's building at Seventh avenue and Fifty-fifth street. The electric lamps produced an effect similar to the light of a cloudy wintry morning, such as the panorama is intended to represent. Even the most minute features were as plainly seen as in the daytime. There were sixteen electric lamps, which hung above the canopy which covers the housetop from which the view is had. No reflectors were used. The light was quite steady. Several different kinds of globes had to be tried before the right sort could be found. A plain ground glass globe was used last evening. London is the only city where a panorama of this kind has been successfully lighted by electricity heretofore. A gentleman who had seen the London panorama lighted by electricity saw the "Siege of Paris" last evening, and said that the latter was the greater success of the two. The panorama will hereafter be opened nightly as well as daily.

Among the telephone stories floating about is the following: An old man would not believe that he could hear his wife talk a distance of five miles by telephone. His better half was in a country store several miles away, where there was a telephone, and the skeptic was also in a place where there was a similar instrument, and on being told how to operate it, he walked boldly up and shouted: "Hello, Sarah!"

At that instant lightning struck the telephone wire and knocked the man down, and as he scrambled to his feet he excitedly cried, "That's Sarah, every time!"

Mr. A. Hanford, formerly at Zacatacas, Mexico, is now situated at Montgomery, Ala., as manager for the Southern Bell Telephone Company.

A London dentist uses a small incandescent carbon lamp to illuminate the cavity of the mouth during dental operations. A torchlight procession would be required for Talmage's facial cavity.

The Fuller Company at Grand Rapids have upwards of one hundred and fifty lights in operation inaugurated since October 1.

The Fuller Company at St. Paul, Minn., are lighting the public streets with lamps placed in clusters on poles.

Of Oscar Wilde's future plans the London *World* says: "He goes back to America in the fall, then to Australia, and ultimately to heaven." Could he not be induced to reverse the order of his trip?

Inquirer: No, we don't believe in taking the bull by the horns. We tried taking a goat by the horns once, and that was excitement enough for us.—*Boston Post.*

Wanted.

An electrician who is a thorough mechanic and practical engineer desires a position as engineer. Unexceptional references given. Address, Alden Bradford, Shoves Mill, No. 2, Fall River, Mass.

Wanted.—By a young man having a thorough scientific education, with a knowledge of electricity and some experience, a situation with an Electric Light Company, where he can learn thoroughly and *practically* the duties of an electrical engineer. Best of references. Address, J.——, 114 East 22d street, New York.

NEW PATENTS—ELECTRICAL—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 26TH, 1882.

269,526 Apparatus for suspending, raising and lowering electric lamps, Charles C. Jennings, Buffalo, N. Y.

269,568 Conduit for electrical conductors, William B. Eltonhead, Philadelphia, Pa.

269,605 Dynamo-electric machine, Elihu Thompson, New Brit in, Conn.

269,761 Dynamo-electric machine, Edward Weston, Newark, N. J,

269,559 Electric current meter, Alex. Bernstein, Boston, Mass.

269,750 Electric incandescent lamp, Edward Weston, New ark, N. J.

269,593 Electric safety apparatus for theatres and other buildings, Charles A. Mayrhofer, Vienna, Austria

269,521 Electric telegraph transmitter, Emery M. Hamilton, New York, N. Y.

269,794 Electro-medical induction coil, Jerome Kidder, deceased, New York, N. Y.

269,757 Incandescent electric lamp holder, Edward Weston, Newark, N. J.

269,807 Insulating wires, Lewis H. McCullough, Richmond, Indiana.

269,634 Printing telegraph, William J. Burnside, Lower Norwood, England.

269,805 Regulator for dynamo-electric machines, Elihu Thomson, New Britain, Conn.

269,605 Regulator for dynamo-e ectric machines, Hiram S. Maxim, Paris, France.

269,657 Speaking telephone, George A. Fitch, Oakland, N. Y.

269,758 Suspending and circuit-controlling mechanism for arc lamps, Edward Weston, Newark, N. J.

269,735 Telegraph and telephone cable, John Speicher, New York, N. Y.

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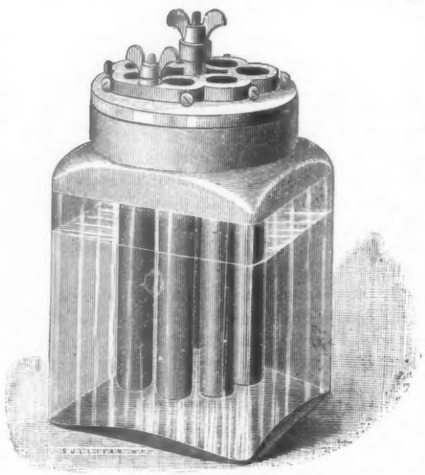

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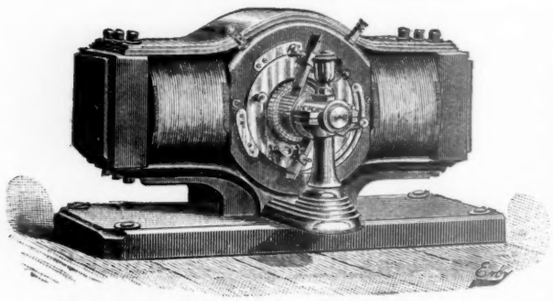

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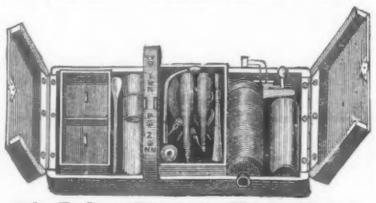

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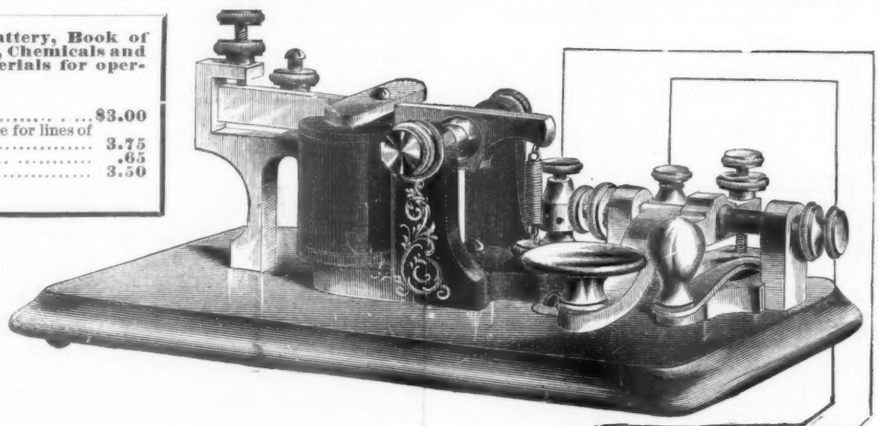

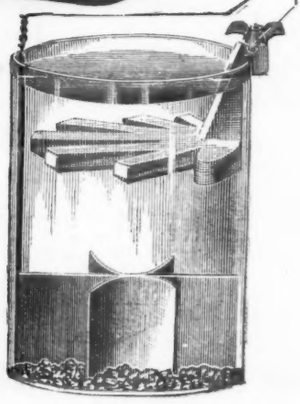

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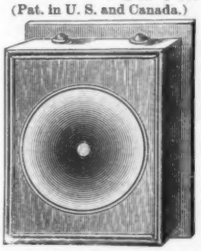

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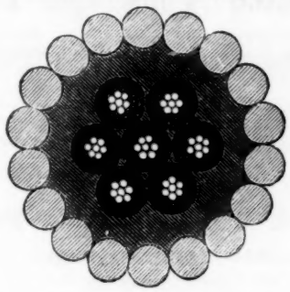

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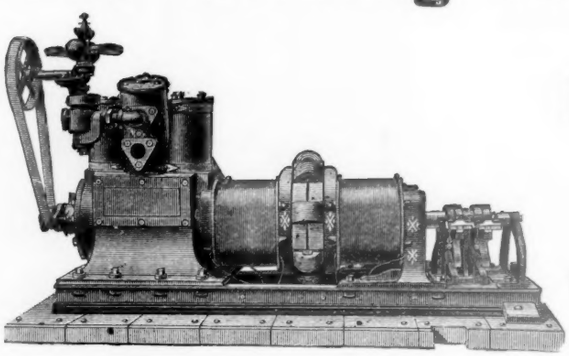

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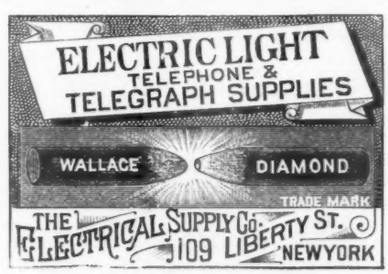

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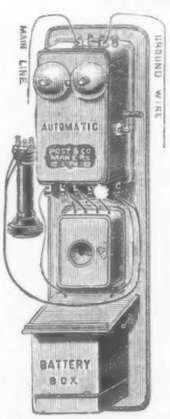

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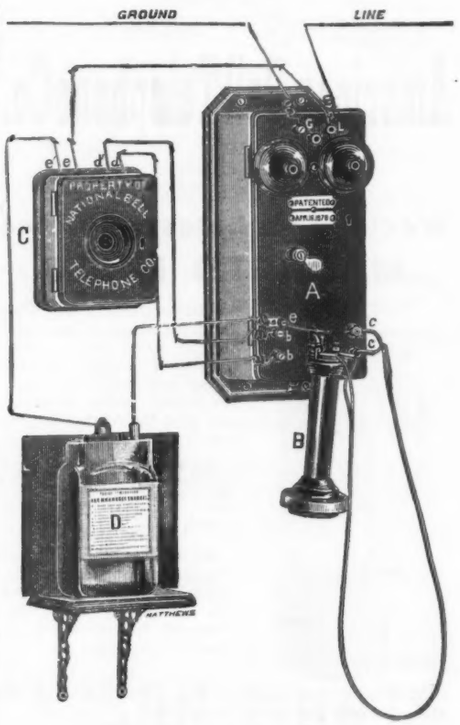

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